

Appl. No. 10/711,198
Amdt. dated September 26, 2005
Reply to Office action of June 28, 2005

REMARKS/ARGUMENTS

1. Rejection of claims 1-14 under 35 U.S.C. 103 (a) as being anticipated by Tzu et al. (US 6,001,512) in view of Lin et al. (US 6,294,295).

Tzu et al. (US 6,001,512) comprises a mask, which has a device region 12, a border region 14, a corner region 15, and a frame cell region 16. The sub-resolution contact holes 20 are added in the border region 14 and the corner region 15 to prevent the side lobe effects, as shown in Fig. 2. But, the frame cells can cause side lobe problems because they disturb the pitch of the contact holes 20, causing the contact holes to lose their effectiveness in the vicinity of the frame cells (col. 2, lines 24-27). The sub-resolution contact holes 20 are added in the frame cell region 16 that influences the sub-resolution contact holes 20 to prevent the side lobe problems. So, Tzu et al. (US 6,001,512) uses a buffer distance 30 between an inner perimeter 28 and an outer perimeter 26 as Fig. 6 shows. The sub-resolution contact holes 20 are added in the outer perimeter as Fig. 9 shows. The buffer distance 30 doesn't have any sub-resolution contact holes 20.

Lin (US 6,294,295) improves the exposure effect in that the dense pattern 118 and the isolated pattern 120 are exposed at the same time. The first attenuating phase shifting material 124 has the first transmittance. The second attenuating phase shifting material 125 has the second transmittance. The second transmittance (10%-20%) is bigger than the first transmittance (5%-7%). Furthermore, the first attenuating phase shifting material 124 and the second attenuating phase shifting material 125 provide 180° phase shift relative to light passing through the substrate 122 (col. 4, lines 32-51). Because the isolated pattern 120 has second

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attenuating phase shifting material 125, which has bigger transmittance, the depth of focus of the isolate pattern is improved (col. 8, lines 8-11). That improves the exposure effect that the dense pattern 118 and the isolated pattern 120 are exposed at the same time.

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To compare the applicant's invention with Tzu et al. (US 6,001,512):

The dummy pattern of the applicant's invention has a phase difference of 180° with a transmitted light of the integrated circuit layout. And the dummy pattern isn't exposed, but the integrated circuit layout is. But, the sub-resolution contact holes 20 of Tzu et al. (US 6,001,512) don't have any limitation of the phase difference of 180° . Thus, the applicant's invention is patentably distinguishable from Tzu et al. (US 6,001,512).

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To compare the applicant's invention with Lin (US 6,294,295):

Lin (US 6,294,295) doesn't have any dummy pattern. The applicant's invention has the dummy pattern, and the dummy pattern has the phase difference of 180° with a transmitted light of the integrated circuit layout. In the applicant's invention, the dummy pattern isn't exposed, but the integrated circuit layout is. But, in Lin (US 6,294,295), the phase difference of 180° is between the attenuating phase shifting material and the transmitted light of the substrate. The phase difference is not between two kinds of patterns. So, Lin (US 6,294,295) can't control the partial pattern to not be exposed, unlike the applicant's invention, which can make the dummy pattern not be exposed.

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Especially, since Lin (US 6,294,295) uses the concept of phase shift

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mask, the phase difference of 180° between the attenuating phase shifting material and the transmitted light of the substrate can improve the exposure effect. So, Lin (US 6,294,295) has no dummy pattern. The applicant's invention not only has a dummy pattern, but the dummy pattern also has the
5 phase difference of 180° with the transmitted light of the integrated circuit layout to make the dummy pattern not exposed. And the dummy pattern of the applicant's invention can improve the optical proximity correction (OPC). The applicant's invention doesn't limit the phase difference between the substrate and the transmitted light of the integrated
10 circuit layout. The methods and the purposes of the applicant's and Lin (US 6,294,295) are different. Thus, the applicant's invention is patentably distinguishable from Lin (US 6,294,295).

To compare the applicant's invention with Tzu et al. (US 6,001,512) in view of Lin (US
15 6,294,295):

If the material of the dummy pattern in Tzu et al. (US 6,001,512) uses the attenuating phase shifting material and opaque material of Lin (US 6,294,295), the dummy pattern will have the phase difference of 180° with the transmitted light of the substrate. It can't make the phase difference of
20 180° between the dummy pattern and the transmitted light of integrated circuit layout, like the applicant's invention. Thus, the applicant's invention is patentably distinguishable from Tzu et al. (US 6,001,512) in view of Lin (US 6,294,295). Reconsideration of the claims is politely requested.

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Furthermore, the applicant's invention noted "the edge length of each dummy pattern is a multiple of exposure wave length, and the multiple is

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- less than 0.6", "the distance between each dummy pattern is a multiple of exposure wave length, and the multiple ranges between 0.3 and 2.0", and "the least distance between the dummy patterns and the circuit layout is a multiple of exposure wave length, the multiple ranges between 0.4 and 2.0".
- 5 The above- mentioned limitations are not taught in Tzu et al. (US 6,001,512) and Lin (US 6,294,295).

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

- 10 Sincerely yours,



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- 20 Note: Please leave a message in my voice mail if you need to talk to me. (The time in D.C. is 12 hours behind the Taiwan time, i.e. 9 AM in D.C. = 9 PM in Taiwan.)